DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1) Claim 26 is rejected under 35 U.S.C. 102(b) as being anticipated by Thundat (US 6289717).

Thundat discloses a method for determining characteristics of a sample under analysis comprising the steps of providing at least one force transducing sensor (Figure 1:3) having a surface. This is disclosed in column 2, lines 21-36 and in column 3, lines 31-49. Column 4, lines 15-41 indicate that the surface has a coating thereon capable of interacting with biological specimens in the sample fluid. Resulting interactions between the specimens and the coated surface of the force transducing sensor are identified. Column 5, lines 1-15 teach that by detecting the motion of the force transducing sensor, one is able to determine the presence of cellular analytes in the sample fluid. In column 6, line 48 to column 7, line 9 and column 7, lines 40-57, Thundat discloses that the microcantilever sensor allows for determination of the concentration of target molecules in a sample solution.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2) Claims 1-8 and 12-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thundat (US 6289717) in view of Thundat (US 6016686).

With respect to claims 1-8, Thundat '9717 discloses a motion sensor comprising at least one force transducing sensor (Figure 1:3) is provided in the form of a microcantilever that is positioned to interact dynamically with a specimen (Figure 1:13) in a fluid sample. Column 2, lines 22-36 and column 3, lines 31-49 indicate that a variety of biological specimens, such as cells, are capable of binding to a microcantilever. Changes in the subsequent deflection of the microcantilever can be detected in order to determine the presence and motion of the specimens. Column 5, lines 1-15 teach that this motion of the force transducing sensor can be measured by deflecting light from a laser (Figure 1:17) off of the microcantilever and onto a photodetector (Figure 1:19). Thundat '9717, however, does not expressly disclose a chamber capable of holding the motion sensor and the biological medium to be analyzed.

Thundat '6686 discloses a similar motion sensor device. Column 3, line 51 to column 4, line 29 indicates that a microcantilever (Figure 1:3) is capable of detecting and measuring changes in the presence of certain physical and chemical parameters

within the sample solution, such as hydrogen ion concentration. Since changes in the hydrogen ion concentration of biological samples is often linked to the activity of living organisms, deflections in the microcantilever can also be used to determine the presence of cells. This is taught in column 10, lines 10-17. A chamber (Figure 10) for containing the motion sensor and biological fluids is disclosed.

Thundat '9717 and Thundat '6686 are analogous art because they are from the same field of endeavor regarding motion sensors comprising microcantilever devices.

At the time of the invention, it would have been obvious to provide the apparatus disclosed by Thundat '9717 with a chamber capable of holding the biological medium and the force transducing sensor. The use of a chamber would have been advantageous because it would have allowed one the ability of conducting experiments in a clearly defined and contained structure that is protected against external contamination. Furthermore, a holding chamber for enclosing a sample would have been an essential and intrinsic component of any detection system involving the analysis of liquids. The use of chambers in biological analytical procedures to contain fluids and instruments is well known in the art.

With respect to claim 12, Thundat '9717 and '6686 disclose the apparatus set forth in the 35 U.S.C. 103 rejection above. In addition, Thundat '9717 discloses in column 3, lines 62-64 that the width of the microcantilever force transducing sensor may be manipulated in any way to produce a variety of desired shapes. One of ordinary skill in the art would have recognized that it would have been beneficial to ensure that the tip of the microcantilever had a longer width than the base in order to create a large analyte

binding area at the end. A thinner base region would have provided the microcantilever with more flexibility when deflected by biological specimens, which in turn would create a more sensitive detector.

With respect to claims 13-19, Thundat '9717 and '6686 disclose the apparatus set forth in the 35 U.S.C. 103 rejection above. In addition, Thundat '9717 discloses in column 4, lines 15-40 that the surface of the force transducing sensor may be coated with a biologically active material in order to facilitate binding with appropriate specimens in the medium. Column 6, lines 39-45 teach that an untreated reference microcantilever (Figure 2:15) may be provided in close proximity to the detection microcantilever (Figure 2:3).

With respect to claims 20-25, Thundat '9717 and '6686 disclose the apparatus set forth in the 35 U.S.C. 103 rejection above. Although not expressly stated, the device proposed by Thundat '9717 is inherently capable of detecting motile cells, such as sperm, since microcantilever detection devices are provided with coatings that encourage the adherence of desired biological analytes. In claims 21-25, Applicant does not cite any critical structural elements designed to accommodate motile cells that are not anticipated by Thundat '9717.

3) Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thundat (US 6289717) in view of Thundat (US 6016686) as applied to claim 1, and further in view of Polla (US 5536963).

The Thundat references disclose the motion sensor set forth in claim 1 as set forth in the 35 U.S.C. 103 rejection above, however do not expressly disclose that the force transducing sensor includes a ribbon.

Polla discloses a plurality of microcantilevers that may deform when acted upon by a force. The degree of deformation may be determined optically. This is disclosed in Figure 1 and in column 3, line 57 to column 4, line 32. Figure 3 and column 5, lines 36-63 disclose one embodiment in which the microcantilever (Figure 3:14) is supported by a substrate on both ends to form a ribbon structure.

Thundat '717 and Polla are analogous art because they are from the same field of endeavor regarding microcantilever sensors.

At the time of the invention, it would have been obvious to form Thundat's force transducing sensor in such a way that the microcantilever structure was supported on both ends to form a ribbon. This would have been beneficial because it would have allowed one to produce a sturdier micromachined sensor that would have been less susceptible to breakage when contacted by analytes in solution. In doing this, the functionality of Thundat's apparatus would not have been lost, since deflections at the center of the ribbon cantilever sensor would still have been able to be detected by the disclosed optical system.

Response to Arguments

Applicant's arguments filed 08 July 2009 with respect to Furcht have been fully considered and are persuasive. These rejections have been withdrawn.

Applicant's arguments filed 08 July 2009 with respect to Welland have been fully considered and are persuasive. These rejections have been withdrawn.

Applicant's arguments filed 08 July 2009 with respect to the Thundat references have been fully considered but they are not persuasive.

Applicant's principle arguments are

(a) Thundat does not disclose the limitation of directing the sample toward the surface of the cantilever at an angle substantially orthogonal to the surface.

In response to Applicant's arguments, please consider the following comments.

Thundat '717 repeatedly makes reference to the surface coatings provided on the flat surfaces of each microcantilever. See column 4, lines 31-40. In order to interact with these coated surfaces, a sample must move at an angle "substantially orthogonal" to the surface. Furthermore, Thundat '717 states that the deflection of the cantilever is "stress-induced." Stress-induced bending of the cantilever as depicted in Figure 2 can only be achieved by a sample moving substantially orthogonal to the cantilever.

(b) Thundat does not disclose that the detector allows a measurable characteristic of the motile sample to be determined through analysis of the microcantilever.

In response to Applicant's arguments, please consider the following comments.

In column 6, line 48 to column 7, line 9 and column 7, lines 40-57, Thundat '717 discloses that the microcantilever sensor allows for determination of the concentration

of target molecules in a sample solution. The concentration of the molecule is considered to be a measurable characteristic.

(c) Thundat does not disclose that the motion detector is used to determine residence times of the motile samples.

In response to Applicant's arguments, please consider the following comments.

The claim limitation "whereby the residence times of the motile samples on the force transducing sensor surface coatings can be determined" is considered to be a recitation of an intended use, and therefore is given little weight when determining the patentability of an apparatus claim.

In response to applicant's argument that the Thundat references do not disclose determination of residence times, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan A. Bowers whose telephone number is (571) 272-8613. The examiner can normally be reached on Monday-Friday 8 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Marcheschi can be reached on (571) 272-1374. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/William H. Beisner/
Primary Examiner, Art Unit 1797

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